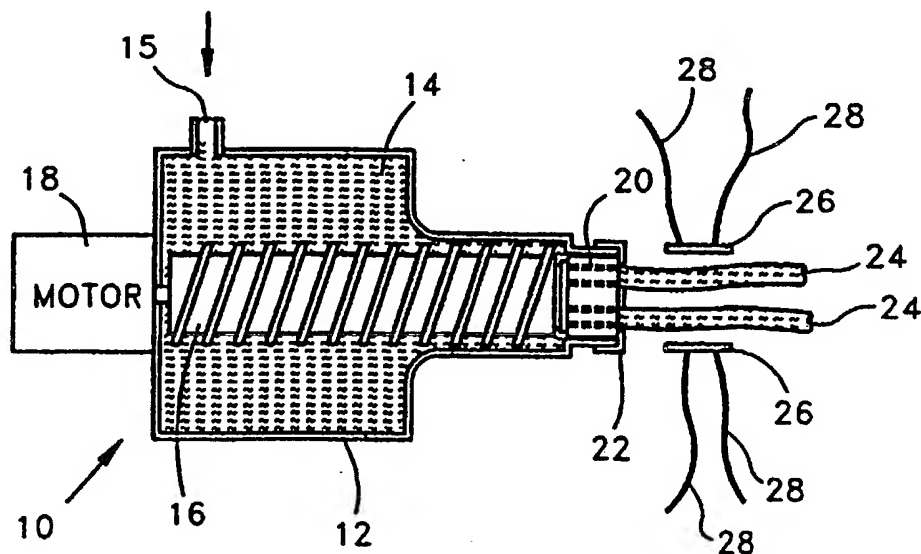




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: A21D 8/00, 13/00, A23P 1/10	A1	(11) International Publication Number: WO 96/20604 (43) International Publication Date: 11 July 1996 (11.07.96)
(21) International Application Number: PCT/US96/00185 (22) International Filing Date: 4 January 1996 (04.01.96) (30) Priority Data: 112,263 5 January 1995 (05.01.95) IL (71) Applicants (for all designated States except US): EATECH - ADVANCED FOOD TECHNOLOGIES LTD. [IL/IL]; P.O. Box 600, 31000 Haifa (IL). KOVALSKY, Cheryl [US/IL]; 22B Hashita Street, P.O. Box 1755, 30900 Zikhron Yaakov (IL). (72) Inventors; and (75) Inventors/Applicants (for US only): HANDELMAN, Doron [IL/IL]; 14 Hama'avak Street, 53520 Givataim (IL). DANZIGER, Pinhas [IL/IL]; 68 Be'eri Street, 46456 Herzeliya (IL). MARMUT, Yehuda [IL/IL]; 20600 Moshava Yoqne'am (IL). TURKASPA, Yosi [IL/IL]; 34 Barkan Street, 81500 Yavne (IL). BARANOVSKY, Rozanna [IL/IL]; 17/1 Ha'Zivony Street, P.O. Box 10263, 20306 Nesher (IL). FELDSHAROV, Konstantin [IL/IL]; 18 Shvil Sivan Street, Givat Ram, 20100 Karmiel (IL). (74) Agents: GALLOWAY, Peter, D.; Ladas & Parry, 26 West 61st Street, New York, NY 10023 (US) et al.		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AZ, BY, KZ, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: EDIBLE UTENSILS AND THE METHODS OF MAKING THEM**(57) Abstract**

A method for preparing an edible eating or drinking utensil such as straw, chop-stick, stirrer or cup including: producing an edible mixture (14); forming an edible utensil (24) from the edible mixture; and heating (26) the edible utensil to cure it and provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptance time period.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

EDIBLE UTENSILS AND THE METHODS OF MAKING THEM

The present invention relates in general to cutlery, dishes, elements and elements which are employed in eating, drinking and handling food and drinks.

BACKGROUND OF THE INVENTION

Vessels, dishes and cutlery which are employed in picking up, cutting and containing food and drinks are generally made of non-biodegradable materials such as plastic, steel, glass and aluminum. Existing elements and dishes of this type include, for example, plastic cups and glass plates. Another material which is commonly used with food and drinks is paper, which, although it may be recycled, has negative ecological effects.

There are also known patents which describe drinking straws having food additives combined with non-biodegradable material.

U.S. Patent 5,094,861 to D'Auguste et al describes a drinking straw arrangement including a drinking tube containing a powdered flavoring laminated to an interior surface of the drinking tube for dissolving upon contact with a fluid directed through the tube, with end caps removably mounted relative to the tube for preserving freshness of the flavoring therewithin.

U.S. Patent 4,921,713 to Fowler describes a straw assembly for imparting flavor to otherwise neutral liquids such as milk or water which includes a first section of straw for immersion in the neutral liquid and a second section of straw for placing in the user's mouth.

U.S. Patent 3,545,980 to Stanger describes a

straw for sipping a drink which is made of a relatively hollow long member, having a piece of candy supported on the end that is to be received in the mouth of the drinker.

U.S. Patent 3,615,595 to Guttag describes a tubular drinking straw having at least a portion of an exposed wall formed of a water insoluble hydrophilic acrylate or methacrylate polymer. A water soluble flavoring agent is dispersed within the polymer and passes by way of the polymer to flavor the liquid in which the straw is placed.

Additionally, Israeli Patent 69765 to Anat Handelman describes an edible drinking straw which contains only edible materials.

SUMMARY OF THE INVENTION

The present invention seeks to provide apparatus and methods for producing elements, dishes, elements, cutlery and containers which are edible.

It is another object of the present invention to provide utensils in the form of elements, dishes, elements, cutlery and containers which are edible by human beings and animals.

There is thus provided in accordance with a preferred embodiment of the present invention a method for preparing an edible eating or drinking utensil including:

producing an edible mixture;
forming an edible utensil from the edible mixture; and

heating the edible utensil to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

Preferably, the edible utensil is any of an edible drinking straw, an edible stirrer, an edible chopstick, an edible cutlery piece, an edible plate, an edible glass and an edible cup.

Additionally, the method may include coating the edible utensil after the heating with an edible layer which is substantially resistant in at least one of a drinkable liquid and an edible food for an acceptable time period.

There is also provided in accordance with a preferred embodiment of the present invention a method of preparing an edible utensil having pre-designed break points including:

producing an edible mixture;

passing the edible mixture via a shaping orifice having a passage of a first width to thereby provide an edible element;

passing the edible element via a shaper, wherein the shaper is operable to compress the edible element at selected spots on the outer peripheral surface of the edible element to thereby decrease a wall thickness of the edible element at the spots and to form an edible utensil having a wall thickness which varies along the utensil length; and

heating the edible utensil to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

Preferably, the edible utensil is any of an edible drinking straw, an edible stirrer and an edible chop-stick.

Additionally, the method may include coating the edible utensil after the heating with an edible layer which is substantially resistant in a drink for an acceptable time period.

In accordance with another preferred embodiment of the present invention there is provided an edible drinking straw including:

a portion of substantially tubular edible rigid element which is to be placed in a drinkable liquid; and

an edible flexible joint portion having a substantially tubular shape coupled at one end to the portion of substantially tubular edible rigid element.

Additionally, the edible drinking straw may include a mouthpiece portion of substantially tubular edible rigid element coupled to the edible flexible joint portion at a second end.

There is also provided in accordance with a preferred embodiment of the present invention an edible drinking straw including a hollow, substantially tube-like element structure made of one layer of edible material, wherein the hollow, substantially tube-like element structure is substantially resistant to disintegration and deformation in a drinkable liquid for an acceptable time period.

Further, in accordance with another preferred embodiment of the present invention there is provided a method for preparing an edible drinking straw having pre-designed break points including:

- producing an edible mixture;

- forming a substantially straw-like edible element structure from the edible mixture;

- compressing the substantially straw-like edible structure at selected spots on the outer peripheral surface of the substantially straw-like edible structure to thereby decrease a wall thickness of the straw-like edible structure at said spots and to form an edible element having pre-designed break points along the edible element length; and

- heating said edible element to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

Preferably, the heating includes applying a flow of heated gas to the mixture.

There is also provided in accordance with another preferred embodiment of the present invention a method for preparing an edible drinking straw including:

- producing an edible mixture;

- forming a substantially straw-like edible element structure from the edible mixture; and

- drying the substantially straw-like edible

element structure to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

Additionally, the method may include coating the substantially straw-like edible element structure after the drying with an edible layer which is substantially resistant in a drink for an acceptable time period.

Preferably, the heating includes at least one of baking, cooking and frying in oil.

In a preferred embodiment of the invention the forming includes at least one of extruding via a shaping orifice, molding, injection molding and casting.

Further, in accordance with another preferred embodiment of the present invention there is provided a method of preparing an edible drinking straw having a flexible joint portion including:

producing a first edible mixture which becomes rigid when cured and a second edible mixture which becomes flexible when cured;

forming a first portion of substantially straw-like edible element structure from the first edible mixture;

forming a second portion of substantially straw-like edible element structure from the second edible mixture;

coupling the first portion and the second portion to form a combined straw-like portion; and

heating the combined straw-like portion to cure it and to thereby provide it with a structure of which part is rigid and part is flexible, the structure being substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable

time period.

Additionally, the method may include coating the combined straw-like portion after the heating with an edible layer which is substantially resistant in a drink for an acceptable time period.

The method may also include:

forming, after the forming a second portion, a third portion of substantially straw-like edible element structure from the first edible mixture; and

coupling the third portion and the combined straw-like portion, after the coupling the first portion and the second portion to form a combined straw-like portion, to form a three-parts straw-like element.

There is also provided in accordance with another preferred embodiment of the present invention an edible stirrer to be employed in stirring at least one of a drink and food including at least one of a substantially rod-like structure and tube-shaped structure made of edible material which is substantially resistant in the at least one of a drink and food for an acceptable time period.

Additionally, the edible stirrer includes pre-designed break points.

Preferably, a cross section of the substantially rod-like structure includes at least one of a non-hollow cross-shaped cross section, a hollow rod-like cross section and a "mark I" shaped cross section and a cross section of the substantially tube-shaped structure includes at least one of ring-like cross section and a "mark 8" hollow shaped cross section.

In accordance with another preferred embodiment of the present invention there is provided a method for preparing an edible stirrer having pre-designed break points including:

producing an edible mixture;

forming a substantially rod-like edible struc-

ture from the edible mixture; and

compressing the substantially rod-like edible structure at selected spots on the outer peripheral surface of the substantially rod-like edible structure to thereby decrease a wall thickness of the rod-like edible structure at said spots and to form an edible element having pre-designed break points along the edible element length; and

heating said edible element to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

Additionally, the method may include coating the substantially rod-like edible structure after the heating with an edible layer which is substantially resistant in at least one of a drink and food for an acceptable time period.

Preferably, the heating includes at least one of baking, cooking and frying in oil.

There is also provided in accordance with another preferred embodiment of the present invention a method for preparing an edible stirrer including:

producing an edible mixture;

forming a substantially rod-like edible structure from the edible mixture; and

drying the substantially rod-like edible structure to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

Additionally, the method may include coating the substantially rod-like edible structure after the drying with an edible layer which is substantially resistant in a drink for an acceptable time period.

Preferably, the forming includes at least one of extruding via a shaping orifice, molding, injection molding and casting.

In accordance with a preferred embodiment of the present invention there is provided an edible chop-stick to be employed in eating food including at least one of a substantially rod-like and tube-shaped structure made of edible material, wherein the structure is substantially resistant in the food for an acceptable time period.

Additionally, the edible chop-stick may include pre-designed break points.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

Fig. 1 is an illustration of a portion of apparatus employed in producing an edible drinking straw constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 2 is an illustration of several structures which may be employed in shaping orifices constructed and operative in accordance with a preferred embodiment of the present invention;

Figs. 3A and 3B together form an illustration of apparatus which is operable to produce edible straws with pre-designed break points;

Figs. 4A and 4B together form an illustration of apparatus for producing edible straws having thin walls constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 5 is an illustration of a portion of a molding apparatus employed in the production of an edible drinking straw constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 6 is an illustration of an edible straw having a flexible joint portion constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 7 is a simplified schematic illustration of apparatus for producing edible straws having flexible joint portions constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 8 is an illustration of an edible straw having a flexible joint portion and produced by employing a mixture which provides a flexible joint portion as an

external coupling layer between two rigid portions of the edible straw;

Figs. 9A - 9F together illustrate various possible arrangements of edible stirrers constructed and operative in accordance with a preferred embodiment of the present invention;

Fig. 10 is an illustration an edible chop-stick constructed and operative in accordance with a preferred embodiment of the present invention; and

Fig. 11 is an illustration of a portion of a molding apparatus employed in the production of edible plates and glasses constructed and operative in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1 which illustrates a top view of a portion of apparatus employed in production of edible drinking straws constructed and operative in accordance with a preferred embodiment of the present invention.

The apparatus of Fig. 1 is operable with an edible mixture which may be processed to provide edible drinking straws. The edible mixture may include edible ingredients such as flour, sugar, fats, salt and food additives such as flavors, edible coloring and spices. Preferably, the edible drinking straw may have a neutral flavor. Alternatively, the edible drinking straw may have any suitable flavor, such as a sweet flavor, a salty flavor and a savory flavor. It is to be appreciated that edible straws having special flavors may be utilized with special drinks. For example savory flavored straws may be used with cocktails and sweet flavored straws may be used with soft drinks.

In accordance with a preferred embodiment of the present invention apparatus 10 includes a container 12 to which an edible mixture 14 is supplied via an opening 15. Apparatus 10 may be part of machinery which blends or kneads the edible ingredients in a mixing tank (not shown) and pushes the prepared mixture, via opening 15, towards apparatus 10 by a conventional material feeder.

Edible mixture 14 is prepared by mixing proportional amounts of edible ingredients in accordance with the type and flavor of edible drinking straw which is to be produced. For example, in order to produce a dough based edible drinking straw the following proportions may be used:

flour - 40 %
water - 36 %

12 % vegetable protein (such as soy protein) -
 edible fibers (such as Inuline) - 4.0 %
 egg powder - 4.0 %
 hydrocolloids - 1.2 %
 dehydrated albumin - 1.2 %
 sugar substitute (such as a mixture of
dextrose and saccharin) - 1.0 %
 emulsifier (such as lecithin) - 0.6 %

and a Q.S. (Quantity Sufficient) of flavoring and coloring. It is to be appreciated that deviations of approximately +/-10% in quantity of each ingredient may be acceptable.

Preferably, the ingredients are kneaded in container 12 by conventional kneading means (not shown), or in the mixing tank. The mixture may be produced by adding gradually the water to the flour and then adding the sweeteners and the other materials. The mixture is kneaded gently until it becomes a homogeneous mixture with a texture of crumbs.

Apparatus 10 also includes a screw or a piston 16 which is operated by a motor 18 to continuously push a portion of the edible mixture towards a shaping orifice 20 which is fastened to container 12 with a fastener cap 22. Shaping orifice 20 may have several passages through which shaped forms of the edible mixture emerge.

Preferably, the shaped forms of the edible mixture which emerge from shaping orifice 20 are a series of hollow tube-like elements 24 each having a wall thickness substantially of the order of 1 - 2 millimeters. The emerging tube-like elements may be cut into pieces having the length of typical drinking straws.

In a preferred embodiment of the present invention heating elements 26 may be positioned at the output of shaping orifice 20 to heat the emerging tube-like elements 24. Heating elements 26 may be electrically

connected by electric wires 28 to a power supply (not shown). Alternatively, heating elements 26 may be embedded in shaping orifice 20 to heat the edible mixture as it forms into tube-like elements. In a preferred embodiment of the invention the heating elements also include a fan (not shown) which applies hot air on the emerging tube-like elements to cure the tube-like elements.

In another preferred embodiment of the invention the tube-like elements 24 are not heated as they emerge from shaping orifice 20 but are rather cut and cured separately. Preferably, tube-like elements 24 are cured by heating or drying in an oven (not shown). The oven may be a turbo-fan oven or a microwave oven which enable baking, heating and/or drying in a warm atmosphere. Alternatively, the tube-like elements 24 may be cooked or fried in oil.

Under the heat provided by heating elements 26, or the heat provided by hot oil in the case of frying in oil, the tube-like elements 24 are cured and their structure becomes rigid and substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period. Thus, the cured tube-like elements may be employed as edible drinking straws.

It is to be appreciated that typically a user finishes a drink in approximately 10 minutes. Therefore, a time period between 15 minutes and an hour, or a longer period, may be an acceptable time period for such an edible utensil to resist disintegration and deformation.

In another preferred embodiment of the present invention the cured tube-like elements are also coated with an edible layer which is substantially resistant to disintegration and deformation in a drink for an acceptable time period. Such a coating layer may, for example, give a smoother texture and may be produced by employing the following formulation:

water - 80.5%
alcohol - 8%
fats (such as sunflower oil) - 1.6%
emulsifier (such as lecithin) - 0.6 %
stabilizers (such as Carrageenan) - 2.4%
edible starch - 4.8%
fibers (such as oatmeal) - 2.0%

and a Q.S. (Quantity Sufficient) of flavoring and coloring. It is to be appreciated that deviations of approximately +/-10% in quantity of each ingredient may be acceptable.

Preferably, the water and the emulsifier are first mixed and then the other ingredients are added.

It is to be appreciated that the apparatus of Fig. 1 may apply a selectable amount of pressure to the edible mixture. The pressure may be regulated in accordance with the desired texture of the edible straw.

The apparatus of Fig. 1 may be also replaced with a conventional extruder which typically performs the same functions of pushing the edible mixture through a shaping orifice. Fitting such an extruder to produce edible straws may be achieved by inserting suitable shaping orifices, such as the shaping orifices which are described herein below.

Reference is now made to Fig. 2 which is a front view illustrating several structures of shaping orifices constructed and operative in accordance with a preferred embodiment of the present invention. Preferably, a shaping orifice provides a plurality of straws having one shape. Alternatively, straws with various shapes may be produced by employing one shaping orifice with different profiles which provide different shaped straws. Fig. 2 illustrates such a shaping orifice having a plurality of differently shaped openings.

A shaping orifice 40 having a cross section 42 includes a plurality of openings each providing an edible

straw with a different profile. Opening 44 provides a straw with a circular, ring profile. Opening 46 provides an edible straw with a "figure 8" shaped profile. Openings 48 and 50 provide edible straws having profiles with reinforced inner portions, in the form of a star and a polygon respectively. Opening 52 provides a circular cylindrical edible straw with internal reinforcement in the form of the "mark +".

It is to be appreciated that the reinforced profile, as described with reference to opening 52, may be particularly useful in producing edible straws having walls which are thinner than the walls of an edible straw having a simple ring profile as produced by employing opening 44. In such a case the wall thickness of the edible straw with profile 52 may be reduced by approximately 10% - 30% without substantially affecting the mechanical properties of the edible straw, as compared to a straw having profile 44. As for profiles 48 and 50, they may require a somewhat thicker wall to achieve a strength substantially equivalent to that of the ring profile 44.

Preferably, all edible straw profiles include walls, each having substantially a thickness of the order of 1 - 2 millimeters.

The structures of openings 44, 46, 48, 50 and 52 are provided by drilling holes in shaping orifice 40 and inserting in the holes, from the rear part of shaping orifice 40, inserts (not shown) having the shapes which provide the inner portions of the respective openings. Each insert allows passage of an edible material to the respective opening.

In order to ease eating of an edible straw it may be useful to create pre-designed break points and regions which are broken more easily than the other portions of the edible straw thus avoiding non-symmetrical breakage of the edible straw when a user bites the edible straw. Such a feature is described in Israeli

patent 69765. Figs. 3A and 3B together form an illustration of apparatus which is operable to provide edible straws having such pre-designed break points.

Fig. 3A illustrates a longitudinal cross section of apparatus 53 for producing edible straws having pre-designed break regions. Apparatus 53 includes a shaping orifice, which may be mounted on apparatus such as apparatus 10 of Fig. 1, or an extruder, and an external unit which may be mounted outside apparatus 10 of Fig. 1, or the extruder, but in front of the shaping orifice.

Apparatus 53 of Fig. 3A is operable with an edible mixture such as the one described with reference to Fig. 1.

The shaping orifice of Fig. 3A includes a substantially cylindrical passage 54, internal walls 55 and external walls 56. An edible mixture which is pushed, by a screw or a piston such as screw 16 of Fig. 1, via passage 54 from an entrance A emerges as a cylindrical element at exit B.

At exit B a compressing unit 57, which forms the external unit mounted in front of the shaping orifice, is operable to create, at selected regions of the emerging cylindrical element, portions having walls which are thinner than the walls of the emerging cylindrical element by pushing and pulling back a shaper 58. Shaper 58 presses the emerging cylindrical element against a portion of the internal wall 55 and creates a notched region on the circumference of the emerging cylindrical element.

Preferably, compressing unit 57 is coupled to motors 59 or to a conventional compressed air system which periodically operates shaper 58. The push/pull operation of shaper 58 creates equally spaced portions having thinner walls. Preferably, the distance along the emerging cylindrical element between one region having

thinner walls and another such region is 2 - 3 centimeters. Thus, the emerging cylindrical element includes portions which are narrowed by shaper 58 and are mechanically weaker than the portions which are not narrowed by shaper 58.

Usually, the wall thickness of the portions of the edible straw which are not narrowed is 1 - 2 millimeters. It is to be appreciated that the thickness of the wall 60 of the cylindrical element may vary by approximately 0.2 - 0.4 millimeter between the regions 61 having thinner walls and the regions 62 having the usual wall thickness.

It is to be appreciated that compressing unit 57 may be built in the shaping orifice, preferably near the exit of the shaping orifice, so that shaper 58 is operable within the shaping orifice to periodically perform the push/pull operation and thus to compress selected portions of the emerging cylindrical element before the selected portions of the cylindrical element exit the shaping orifice.

Fig. 3B is a perspective view of compressing unit 57. Four quadrants 65 are spaced from each other so that they form a circular opening between them having a diameter which is at least equal to the diameter of the emerging cylindrical element having the usual wall thickness. The inner portions of the quadrants 65 together form shaper 58.

Quadrants 65 are mounted on a holder 67 which is positioned and clamped (not shown) in front of the shaping orifice of Fig. 3A (not shown). Quadrants 65 are coupled to pistons or linear actuators 66, which are operative to push and pull quadrants 65 simultaneously. Pistons 66 may be operated by motors 59. Alternatively, pistons 66 may be operated by a conventional compressed air system (not shown) which pushes and pulls the pistons simultaneously.

Initially, quadrants 65 are set apart from each other and an edible element which passes through the circular opening between the quadrants is unaltered. When quadrants 65 are pushed by pistons 66, each quadrant approaches the other quadrants until all quadrants are stopped by contacting two other quadrants.

When the quadrants are stopped the diameter of the circular opening between them is smaller than the diameter of the edible element which passes in the circular opening. Thus, the edible element is compressed and narrowed at the sections which are in contact with the inner portions of quadrants 65, i.e. with shaper 58.

It is to be appreciated that the amount of narrowing of the emerging edible elements may be provided by adjusting the strokes of pistons 66. Preferably, the narrowing of the edible elements may be approximately 0.2 - 0.5 millimeters.

When quadrants 65 are pulled by linear actuators 66 the diameter of the circular opening is increased and the cylindrical element passes unaltered. Thus, the cylindrical element is not narrowed when quadrants 65 are pulled.

The tube-like element emerging from the apparatus of Figs. 3A and 3B and the edible straw which is created after curing the tube-like element, have sections which are narrower than the other parts of the tube-like element. Thus, when a user bites the edible straw, breakage normally takes place first at the mechanically weak sections, i.e. at the narrower sections which have thinner than usual walls.

Reference is now made to Fig. 4A which illustrates apparatus for producing edible straws having thin walls, constructed and operative in accordance with a preferred embodiment of the present invention.

The apparatus of Fig. 4A, generally indicated by reference numeral 70, may be associated with an

extruder, or apparatus, such as apparatus 10 of Fig. 1, which pushes an edible mixture towards a shaping orifice.

Apparatus 70 includes a container 72 having walls 74 and an opening 75 through which an edible mixture 76 is inserted. Edible mixture 76 may be pushed by a piston or a screw 78. Preferably, piston or screw 78 are operated by a motor (not shown) in the extruder.

In a preferred embodiment of the present invention piston or screw 78 are ring shaped and surround a rotating eccentric compression element 80 which may be operated by a motor 81 which may be part of the extruder (not shown). Preferably, rotating eccentric compression element 80 rotates independently with respect to the rotation of piston or screw 78. Additionally, rotating eccentric compression element 80 rotates faster than piston or screw 78, such as approximately 50 times faster.

Rotating eccentric compression element 80 includes a rotating rod 82 which is inserted in a shaping orifice 83 and performs an eccentric motion around axis 84 of motor 81. In a case where edible straws having substantially a diameter of 6.0 millimeters are produced, rotating rod 82 may have a diameter of typically 3.0 millimeters and axis 84 may be displaced by 0.2 - 1.0 millimeters from an axis 85 of rotating rod 82.

Shaping orifice 83 has walls 86 and a passage 87 in which rotating rod 82 performs the eccentric motion. Passage 87 is wider than rotating rod 82 so that during the eccentric rotation of rotating rod 82, a bottom 88 of rod 82 approaches a portion of the wall 86 and is driven away from another portion of wall 86.

Rotating rod 82 is operable to compress the edible mixture horizontally towards the walls 86 of shaping orifice 83 and thus to create an edible element having compressed thin walls 89.

When rotating rod 82 performs the eccentric

rotation, edible mixture may enter in the space between rotating rod 82 and rotating eccentric compression element 80. A flexible rubber cover 90 covers the area between rotating rod 82 and rotating eccentric compression element 80 to prevent such an entrance of edible mixture.

Reference is now made to Fig. 4B which is an enlarged bottom view illustration of the eccentric, or off-axis, operation of the apparatus of Fig. 4A.

The distance C indicates an eccentricity between axis 85 of rotating rod 82 of Fig. 4A and rotation axis 84 of motor 81 of Fig. 4A. When rotated in the direction indicated by reference numeral 91, bottom 88 of rotating rod 82 of Fig. 4A performs a circular motion having an envelope 92.

The circular motion of bottom 88 compresses the edible mixture which is present in the vicinity of bottom 88 between envelope 92 and an envelope 93 of the walls 86 of shaping orifice 83 of Fig. 4A. The wall thickness of an emerging edible element is equal to the distance between envelope 92 and envelope 93.

The wall thickness of an edible element which emerges from the apparatus of Figs. 4A and 4B may be selected in accordance with the amount of eccentricity C and the amount of compression of the edible mixture may be selected in accordance with the velocity of rotation of bottom 88 of rotating rod 82.

It is to be appreciated that edible straws may be also produced by employing a molding apparatus instead of the apparatus of Fig. 1 or an extruder. Such molding apparatus is illustrated in Fig. 5.

Molding apparatus 110 of Fig. 5 may include a static part 111 and a moving part 112, each including portions 113 of molds, which typically provide, when closed, the shape of a plurality of straws having substantially the desired wall thicknesses of the order of 1

- 2 millimeters.

An edible mixture may be inserted via openings 114 in molds 113 when static part 111 and moving part 112 are closed. Mold 113 may include cylindrical pins 115 around which the edible mixture is arranged. Preferably, mold 113 is heated by heating elements (not shown) to cure the edible mixture therein. When the edible mixture is cured cylindrical pins 115 are drawn out and mold 113 is opened. Then, the cured edible elements, now being edible drinking straws, are removed. It will be apparent to one skilled in the art that such a process is similar to a molding process typically used in the plastics industry.

It is also to be appreciated that an injection molding process associated with an injection machine, or a casting process associated with a casting machine, similar to the ones employed in the plastics industry, may be employed for producing edible straws in accordance with a preferred embodiment of the present invention. Such processes, which have already been adapted in the food industry for food production, may require some adaptations for producing edible straws. Such adaptations may include using an edible mixture in accordance with the present invention, adaptation of the heating temperature and adaptation of the structure of the mold so as to provide a straw-like structure.

In the above mentioned molding process, as well as in the injection molding process and in the casting process, an edible mixture which is more fluid may be required. Such an edible mixture may be provided by adding water to the mixture until the crumb texture of the edible mixture disappears. Alternatively, the mixture with the crumb texture, as described with reference to the apparatus of Fig. 1 and to the extruder, may be employed in any of the molding process, the injection molding process and the casting process together with a

pressing unit (not shown), which is generally a part of a material feeder in any of a molding machine, an injection machine and a casting machine. The pressing unit is operable to continuously apply pressure to push the mixture with the crumb texture into the respective molds until the molds are homogeneously filled with the edible mixture.

Reference is now made to Fig. 6 which is an illustration of an edible straw having a flexible joint portion constructed and operative in accordance with a preferred embodiment of the present invention.

An edible straw 120 preferably includes a rigid portion 122 of a substantially tubular edible element which is typically dipped in a drinkable liquid during use. An edible flexible joint portion 124, having a substantially tubular shape, is coupled at one end thereof to the rigid portion 122 and at an opposite end thereof to a substantially tubular edible mouthpiece portion 126. Preferably, flexible joint portion 124 may be bent in any direction to enable easy manipulation thereof by a user while drinking.

In an alternative embodiment of the present invention flexible joint portion 124 may be held in the mouth of the user while drinking and element 126 may be eliminated.

Preferably, the wall thickness of the portions 122, 124 and 126 are identical and are each substantially 1 - 2 millimeters.

The rigid portions may be produced of the same edible mixture as described with reference to Fig. 1. The flexible joint portion 124 may be preferably produced by employing the following formulation:

flour - 39.2%
water - 37.2%
vegetable protein (such as soy protein) -

12.9%

egg powder - 3.9%

fibers (such as oatmeal) - 5%

emulsifier (such as lecithin) - 0.6%

sugar substitute (such as a mixture of dextrose and saccharin) - 1.2%.

It is to be appreciated that deviations of approximately +/-10% in quantity of each ingredient may be acceptable.

Preferably, the water and the flour are first mixed and then the other ingredients are added.

The rigid portions of the edible straw having a flexible joint portion may be produced in the same manner as mentioned above. However, the addition of the flexible joint portion may require some modifications in the production process and in the machines required for manufacturing.

Fig. 7 is a simplified schematic illustration of apparatus for producing edible straws having flexible joint portions constructed and operative in accordance with a preferred embodiment of the present invention. The apparatus of Fig. 7 is described with reference to apparatus 10 of Fig. 1 or to an extruder.

The apparatus of Fig. 7 is operable to receive two types of edible mixtures 150 and 152, preferably from two separate tanks (not shown) which form part of the extruder (not shown). Edible mixture 150 provides, after it is suitably shaped and cured, a rigid portion of an edible straw, and edible mixture 152 provides, after it is suitably shaped and cured, a flexible joint portion of the edible straw.

The apparatus of Fig. 7 has substantially a form similar to that of a conventional double injector whereby edible mixtures 150 and 152 are injected via passages 154 and 156 respectively. Passages 154 and 156 have valves 158 and 160 respectively at their ends. The two passages 154 and 156 are coupled at their ends with a common passage 162 which is coupled to a shaping orifice

164 of the type described with reference to Fig. 1.

Preferably, when valve 158 is opened, valve 160 is closed and vice versa. When valve 158 is opened, edible mixture 150 only passes in common passage 162 and is pushed towards shaping orifice 164. The tube-like element emerging from shaping orifice 164 is the portion of the edible straw which becomes rigid when cured.

After producing such a tube-like element, with a length typically equal to two thirds ($2/3$) of the length of a typical straw, valve 158 is closed and valve 160 is opened to allow passage of edible mixture 152 via common passage 162 and via shaping orifice 164. The portion of edible mixture 152 shaped in shaping orifice 164 is coupled to the previously emerging tube-like element thus providing a tube-like element having two portions 166 and 168 of different edible mixtures. If an edible straw having two rigid parts is required as described herein above, valve 160 may be closed and valve 158 may be again opened to repeat the production of an additional rigid portion, this time of a shorter length.

If an injection molding process is employed to produce an edible straw with a flexible joint portion, two or three injectors may be employed to inject the necessary edible mixtures via two or three openings respectively, such as openings 114 in mold 113 of Fig. 5.

Preferably, a first injector injects a portion of the edible mixture associated with the rigid portion of the edible straw which is to be dipped in a drinkable liquid at a first location in the mold, a second injector injects a portion of the edible mixture associated with the flexible joint portion at a second location in the mold, adjacent to the first location, and a third injector injects a portion of the edible mixture associated with the rigid portion of the edible straw which it to be held in the mouth of the user (the mouthpiece portion) at a third location in the mold adjacent to the second

location.

In the mold, the portion of the mixture associated with the flexible joint portion of the edible straw is located between, and in contact with, the portions of the mixtures associated with the two rigid portions of the edible straw. When the mold is heated the three portions of the mixtures cure to provide an edible straw having a flexible joint portion.

It is to be appreciated that if the edible straw contains only one rigid portion and a flexible joint portion only two injectors may be employed, one injecting a portion of the mixture associated with the flexible joint portion of the edible straw and the other injecting a portion of the mixture associated with the rigid portion of the edible straw which is to be dipped in a drinkable liquid.

If an injection molding process or a casting process are employed to produce an edible straw with a flexible joint portion, two feeders may be employed to inject or supply the two types of mixtures during separate time periods.

In such cases, a mold may be first fed or injected with a first portion of the mixture associated with the rigid portion of the edible straw which is to be dipped in a drinkable liquid and then fed or injected with a second portion of the mixture associated with the flexible joint portion of the edible straw. After that, a third portion of the mixture associated with the mouth-piece rigid portion of the edible straw may be fed or injected.

After applying heat, the mixtures cure to provide an edible straw having a flexible joint portion. If a straw with only one rigid portion is required, then the process includes only two steps, i.e. feeding or injecting of the mixtures to provide the first and the second portions of the edible straw only.

It is to be appreciated that in any of the molding process, the injection molding process and the casting process the edible straws may include walls having a wall thickness which is constant or varying along either or both the length or circumference thereof.

In another preferred embodiment of the present invention an edible straw having a flexible joint portion may be produced by employing the mixture which provides the flexible joint portion as an external coupling layer between two rigid portions of the edible straw. An edible straw so produced is illustrated in Fig. 8.

The edible straw of Fig. 8, generally indicated by reference numeral 180, includes two rigid portions 182 and 184. The rigid portions of the edible straw are initially positioned in contact with each other so as to provide substantially one straw cut at a plane perpendicular to the longitudinal axis 186. The edible mixture which provides the flexible joint portion of the straw is then spread along the outer peripheral surface of the two rigid portions which are in contact to provide a coupling layer 188 shaped as small hills of edible material having substantially the height of 1 millimeter. The rigid portions are then separated to provide a small separation 190 between the two rigid portions. The separation thus created between the two rigid portions may be of the order of a few millimeters, such as 3 millimeters.

The rigid portions 182 and 184 are then held at their separated position in an oven for a time period which is sufficient for the edible mixture which forms the coupling layer 188 to cure. It is to be appreciated that since the edible mixture which forms the coupling layer 188 is generally viscous, it does not substantially flow in the separation space 190, and the separation space 190 is therefore not blocked. Thus, the edible mixture which provides the flexible joint portion creates a coupling layer, substantially of 1 millimeter thick-

ness, between the two rigid portions which holds the rigid portions tightly but enables both passage of a drinkable liquid and bending at the boundary between the two rigid portions.

It is to be appreciated that a wholly flexible edible straw may be also produced by employing the same production methods and apparatus as described herein above with reference to Figs. 1 - 8. Such an edible straw may be produced by employing the following formulation:

water - 76 %

sugar (such as sucrose) - 20 %

stabilizers (such as Locust Bean Gum and Carrageenan) - 4 %.

It is to be appreciated that deviations of approximately +/-10% in quantity of each ingredient may be acceptable.

Preferably, the water and the emulsifier are first mixed and then the other ingredients are added. In accordance with a preferred embodiment of the present invention curing is done by drying the edible element formed thereto.

Reference is now made to Figs. 9A - 9F, which together illustrate various possible arrangements of edible stirrers constructed and operative in accordance with a preferred embodiment of the present invention. Such edible stirrers may be applied in stirring food or drinks.

In Fig. 9A an edible stirrer 250 having a rod-like structure and a cross-like shaped cross section 252 which is uniform along all stirrer's length is illustrated. Preferably, the length of the edible stirrer 250 is about 15 centimeters which is a few centimeters longer than a length of a typical cup or glass. The cross-like cross section creates a rigid structure, in both the length and width of the stirrer, which results in an edible stirrer which does not break easily. The edges 254 along the four wings of the cross-like shaped stirrer are

rounded so as to provide smooth grip of the stirrer.

In Fig. 9B another possible arrangement of an edible straw is illustrated. An edible stirrer 260 has a rod-like structure and a "mark I" shaped cross section 262 which is uniform along all stirrer's length. As in Fig. 9A, the "mark I" shaped cross section creates a rigid structure, in both the length and width of the stirrer, which results in an edible stirrer which does not break easily. The edges 264 of the "mark I" shape are rounded so as to provide smooth grip of the stirrer. The length of the stirrer may be the same as the one of Fig. 9A.

Other possible arrangements for an edible stirrer are illustrated in Figs. 9C, 9D, 9E and 9F. The stirrers of Figs. 9C, 9D, 9E and 9F are hollow elements with various cross section shapes. In Fig. 9C a stirrer 270 has a cylindrical shape with a ring-like cross section 272 and in Fig. 9D a stirrer 274 has an "mark 8" shaped cross section 276. The stirrer 278 of Fig. 9E is similar to the stirrer of Fig. 9C except that the cross section 280 is the ring shape of Fig. 9C reinforced with a bar 282 which divides the ring into two halves. The stirrer 284 of Fig. 9F is similar to the stirrer of Fig. 9C except that two bars 288 and 290, each being substantially normal to the other, are employed to reinforce the ring shaped cross section. Stirrers 278 and 284 may be provided with thin walls.

It is to be appreciated that each of the shapes described in Figs. 9A - 9F may provide an edible stirrer with a rigid structure. Additionally, it is to be appreciated that any combination of the structures illustrated in Figs. 9A - 9F may be applied and other conventional arrangements for edible stirrers may be also provided, such as various types of non-hollow cylindrical shapes, rod shapes, hollow rod shapes and any combination thereof.

The edible stirrers of Figs. 9A - 9F may be formed of an edible mixture which is similar to the edible mixture employed in the production of an edible drinking straw as described herein above with reference to Figs. 1 - 8. Preferably, the edible stirrers in accordance with a preferred embodiment of the invention may be produced with the same machinery as employed for the production of edible straws, i.e. any apparatus such as apparatus 10 of Fig. 1, an extruder, a molding machine, an injection machine and a casting machine. In such a case different shaping orifices and molds are employed which comply with the shapes of the edible stirrers.

Specifically, the stirrers of Figs. 9A - 9F may be produced by employing, in apparatus 10 of Fig. 1 or in an extruder, shaping orifices having passages shaped as the cross sections of the respective stirrers illustrated in Figs. 9A - 9F. Additionally, molds shaped as the stirrers of Figs. 9A - 9F may be employed in one of a molding machine an injection machine and a casting machine to produce the stirrers of Figs. 9A - 9F.

It is also to be appreciated that the same production processes as employed in the production of edible straws may be employed in the production of edible stirrers as well. Thus, any of an extrusion process, a molding process, an injection molding process and a casting process may be employed to form the shapes of the stirrers from an original edible mixture.

The shaped stirrers are then cured by any of heating in an oven, cooking, drying or frying in oil. Additionally, the stirrers may be coated with a coating layer which is resistant to hot drinks or cold drinks for a period of time which is acceptable for stirring the drinks, such as the coating layer described with reference to the above mentioned edible straws.

Preferably, edible stirrers having pre-designed narrow portions and edible stirrers having thin walls may

be produced in the same manner as described with reference to the edible straws. Additionally, the same machinery and the same production processes as employed for the edible straws as described herein above may be applied for edible stirrers.

As mentioned herein above, an edible stirrer is uniformly built of an edible material which is resistant to hot and cold drinks for at least a time period which is acceptable for stirring drinks. Alternatively, an edible stirrer in accordance with a preferred embodiment of the present invention, may include an edible inner layer which is not resistant to hot or cold drinks, and external layers which are made of edible materials which are resistant to hot drinks and cold drinks for at least a time period which is acceptable for stirring such drinks. In another preferred embodiment of the invention separate stirrers may be produced for cold drinks, for hot drinks, for soft drinks and for alcoholic drinks, each of the stirrers being resistant to the type of drink for which it is employed.

The edible materials which form an edible stirrer in accordance with a preferred embodiment of the present invention may have neutral tastes. Alternatively, an edible stirrer may have a sweet taste, a salty taste and a savory taste.

Reference is now made to Fig. 10 which is an illustration of an edible chop-stick constructed and operative in accordance with a preferred embodiment of the present invention.

The edible chop stick of Fig. 10, generally indicated by reference numeral 300, preferably includes a cylindrical portion of edible material 302 and a rod-like portion of edible material 304 having a substantially square cross section with smoothed ends and slightly concaved sides. Preferably, the length of the edible chop-stick is similar to the length of typical wood made

chop-sticks, i.e. about 25 centimeters. The cross section of portion 304 creates a rigid structure, in both the length and width of the chop-stick, which results in an edible chop-stick that does not break easily. The smooth ends of portion 304 enable eating without scratching the mouth.

Preferably, edible chop-sticks in accordance with a preferred embodiment of the present invention may be produced by employing one of a molding process, an injection molding process and a casting process as described with reference to the above mentioned edible straws. In such a case molds shaped as the shape of the edible chop-sticks of Fig. 10 may be prepared and employed in the selected production process.

In accordance with a preferred embodiment of the invention additional edible utensils may be produced, such as cutlery, plates, glasses and cups. The cutlery may include spoons, forks, knives and teaspoons which have the same structures as disposable, plastic made cutlery. These utensils may be produced of the same edible mixture as described with reference to the above mentioned edible straws, edible stirrers and edible chop-sticks.

It is however to be appreciated that some of the production processes described herein above with reference to the edible straws and edible stirrers may not be employed in the production of cutlery, plates and glasses. Specifically, an extrusion process may not be suitable for the production of such utensils.

Utensils including cutlery, plates, glasses and cups may be therefore produced by employing a molding process. In such a case molds which are shaped as the utensils which are to be produced may be prepared and used in the molding process.

Reference is now made to Fig. 11 which is an illustration of a portion of a molding apparatus employed

in the production of edible plates and glasses constructed and operative in accordance with a preferred embodiment of the present invention.

The apparatus of Fig. 11, generally indicated by reference numeral 320, may include a mold having a static part 322 and a moving part 324 which provide, when closed, the shape of the utensils to be produced. The static part 322 includes a portion of a plate mold 326 and a portion of a glass mold 328. The moving part 324 includes the counterparts 330 and 332 of the plate mold and the glass mold respectively. Alternatively, static part 322 and moving part 324 may each include portions of only a plate mold or a glass mold.

When static part 322 and moving part 324 are closed, an edible mixture, such as the edible mixture described with reference to the edible straws, is inserted in the spaces between plate mold 326 and its counterpart 330 and between glass mold 328 and its counterpart 332.

Preferably, the spaces between plate mold 326 and its counterpart 330 and between glass mold 328 and its counterpart 332 are substantially 2 - 3 millimeters thick thus enabling the production of utensils each having such a wall thickness. The edible mixture may be compressed by a pressing unit (not shown) in order for the edible mixture to be homogeneously spread in the molds. Then, the edible mixture in the molds is cured, preferably by heating.

After the edible mixture is cured static part 322 and moving part 324 are separated and the edible plate and glass thus produced are ejected..pa

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined only by the claims which follow:

C L A I M S

1. A method for preparing an edible eating or drinking utensil comprising:
 - producing an edible mixture;
 - forming an edible utensil from said edible mixture; and
 - heating said edible utensil to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.
2. A method according to claim 1 wherein said edible utensil is any of an edible drinking straw, an edible stirrer, an edible chop-stick, an edible cutlery piece, an edible plate, an edible glass and an edible cup.
3. A method according to claim 1 and comprising coating said edible utensil after said heating with an edible layer which is substantially resistant in at least one of a drinkable liquid and an edible food for an acceptable time period.
4. A method of preparing an edible utensil having pre-designed break points comprising:
 - producing an edible mixture;
 - passing said edible mixture via a shaping orifice having a passage of a first width to thereby provide an edible element;
 - passing said edible element via a shaper, wherein said shaper is operable to compress the edible element at selected spots on the outer peripheral surface of the edible element to thereby decrease a wall thick-

ness of the edible element at said spots and to form an edible utensil having a wall thickness which varies along the utensil length; and

heating said edible utensil to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

5. A method according to claim 4 and wherein said edible utensil is any of an edible drinking straw, an edible stirrer and an edible chop-stick.

6. A method according to any of the claims 4 and 5 and comprising coating said edible utensil after said heating with an edible layer which is substantially resistant in a drink for an acceptable time period.

7. An edible drinking straw comprising:
a portion of substantially tubular edible rigid element which is to be placed in a drinkable liquid; and
an edible flexible joint portion having a substantially tubular shape coupled at one end to said portion of substantially tubular edible rigid element.

8. An edible drinking straw according to claim 7 and comprising a mouthpiece portion of substantially tubular edible rigid element coupled to said edible flexible joint portion at a second end.

9. An edible drinking straw comprising a hollow, substantially tube-like element structure made of one layer of edible material, wherein said hollow, substantially tube-like element structure is substantially resistant to disintegration and deformation in a drinka-

ble liquid for an acceptable time period.

10. A method for preparing an edible drinking straw having pre-designed break points comprising:

producing an edible mixture;

forming a substantially straw-like edible element structure from said edible mixture;

compressing the substantially straw-like edible structure at selected spots on the outer peripheral surface of the substantially straw-like edible structure to thereby decrease a wall thickness of the straw-like edible structure at said spots and to form an edible element having pre-designed break points along the edible element length; and

heating said edible element to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

11. A method for preparing an edible drinking straw according to claim 10 wherein said heating comprises applying a flow of heated gas to the mixture.

12. A method for preparing an edible drinking straw comprising:

producing an edible mixture;

forming a substantially straw-like edible element structure from said edible mixture; and

drying said substantially straw-like edible element structure to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

13. A method for preparing an edible drinking straw according to claim 12 and comprising coating said substantially straw-like edible element structure after said drying with an edible layer which is substantially resistant in a drink for an acceptable time period.

14. A method for preparing an edible drinking straw according to any of the claims 10 and 11 wherein said heating comprises at least one of baking, cooking and frying in oil.

15. A method for preparing an edible drinking straw according to any of the claims 10, and 11 - 14 wherein said forming comprises at least one of extruding via a shaping orifice, molding, injection molding and casting.

16. A method of preparing an edible drinking straw having a flexible joint portion comprising:

producing a first edible mixture which becomes rigid when cured and a second edible mixture which becomes flexible when cured;

forming a first portion of substantially straw-like edible element structure from said first edible mixture;

forming a second portion of substantially straw-like edible element structure from said second edible mixture;

coupling said first portion and said second portion to form a combined straw-like portion; and

heating said combined straw-like portion to cure it and to thereby provide it with a structure of which part is rigid and part is flexible, said structure being substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

17. A method according to claim 16 and comprising coating said combined straw-like portion after said heating with an edible layer which is substantially resistant in a drink for an acceptable time period.

18. A method according to any of the claims 16 and 17 and comprising:

forming, after said forming a second portion, a third portion of substantially straw-like edible element structure from said first edible mixture; and

coupling said third portion and said combined straw-like portion, after said coupling said first portion and said second portion to form a combined straw-like portion, to form a three-parts straw-like element.

19. A method according to claim 18 and comprising coating said three-parts straw-like element after said heating with an edible layer which is substantially resistant in a drink for an acceptable time period.

20. An edible stirrer to be employed in stirring at least one of a drink and food comprising at least one of a substantially rod-like structure and tube-shaped structure made of edible material which is substantially resistant in said at least one of a drink and food for an acceptable time period.

21. An edible stirrer according to claim 20 and comprising pre-designed break points.

22. An edible stirrer according to any of the claims 20 and 21 and wherein a cross section of the substantially rod-like structure comprises at least one of a non-hollow cross-shaped cross section, a hollow rod-like cross section and a "mark I" shaped cross section.

23. An edible stirrer according to any of the claims 20 and 21 and wherein a cross section of the substantially tube-shaped structure comprises at least one of ring-like cross section and a "mark 8" hollow shaped cross section.

24. A method for preparing an edible stirrer having pre-designed break points comprising:

producing an edible mixture;

forming a substantially rod-like edible structure from said edible mixture;

compressing the substantially rod-like edible structure at selected spots on the outer peripheral surface of the substantially rod-like edible structure to thereby decrease a wall thickness of the rod-like edible structure at said spots and to form an edible element having pre-designed break points along the edible element length; and

heating said edible element to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with at least one of a drinkable liquid and an edible food for an acceptable time period.

25. A method for preparing an edible stirrer according to claim 24 and comprising coating said substantially rod-like edible structure after said heating with an edible layer which is substantially resistant in at least one of a drink and food for an acceptable time period.

26. A method for preparing an edible stirrer according to any of the claims 24 and 25 wherein said heating comprises at least one of baking, cooking and frying in oil.

27. A method for preparing an edible stirrer comprising:

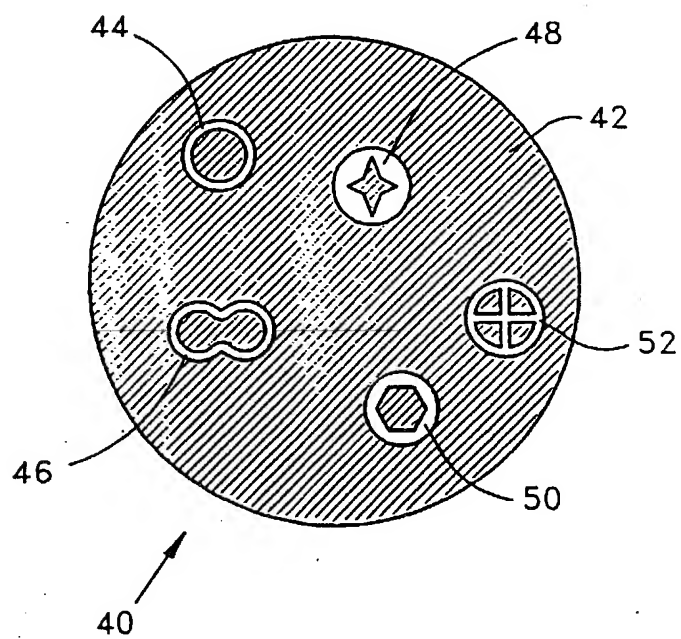
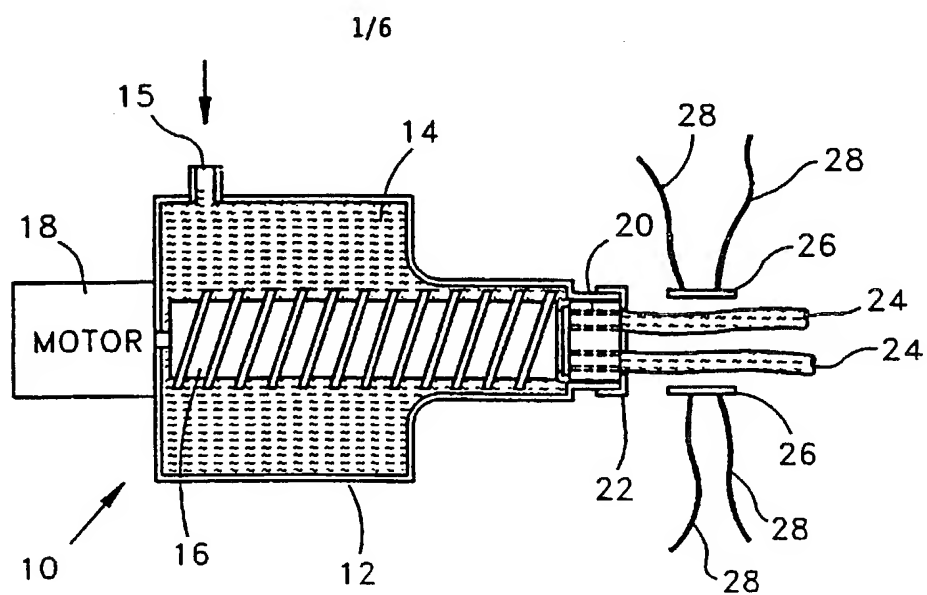
producing an edible mixture;
forming a substantially rod-like edible structure from said edible mixture; and
drying said substantially rod-like edible structure to cure it and thereby to provide it with a structure which is substantially resistant to at least one of deformation and disintegration due to contact with a drinkable liquid for an acceptable time period.

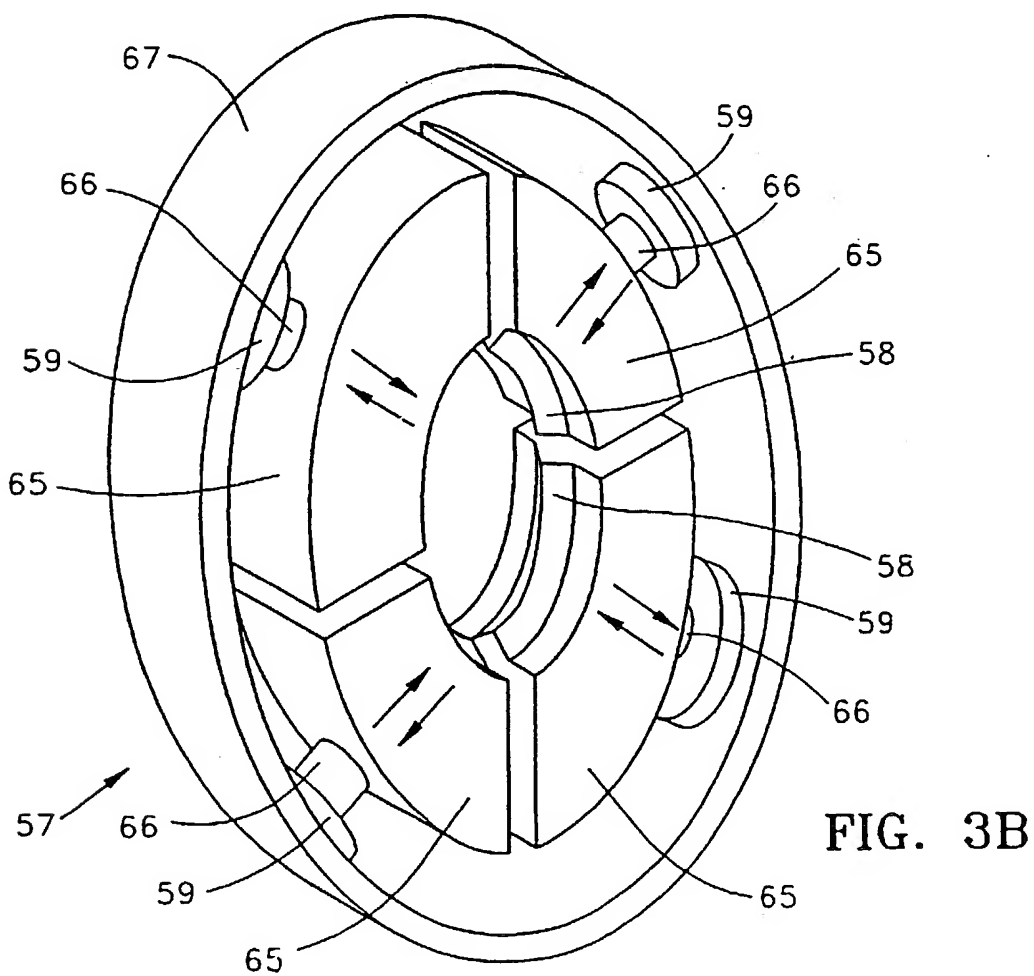
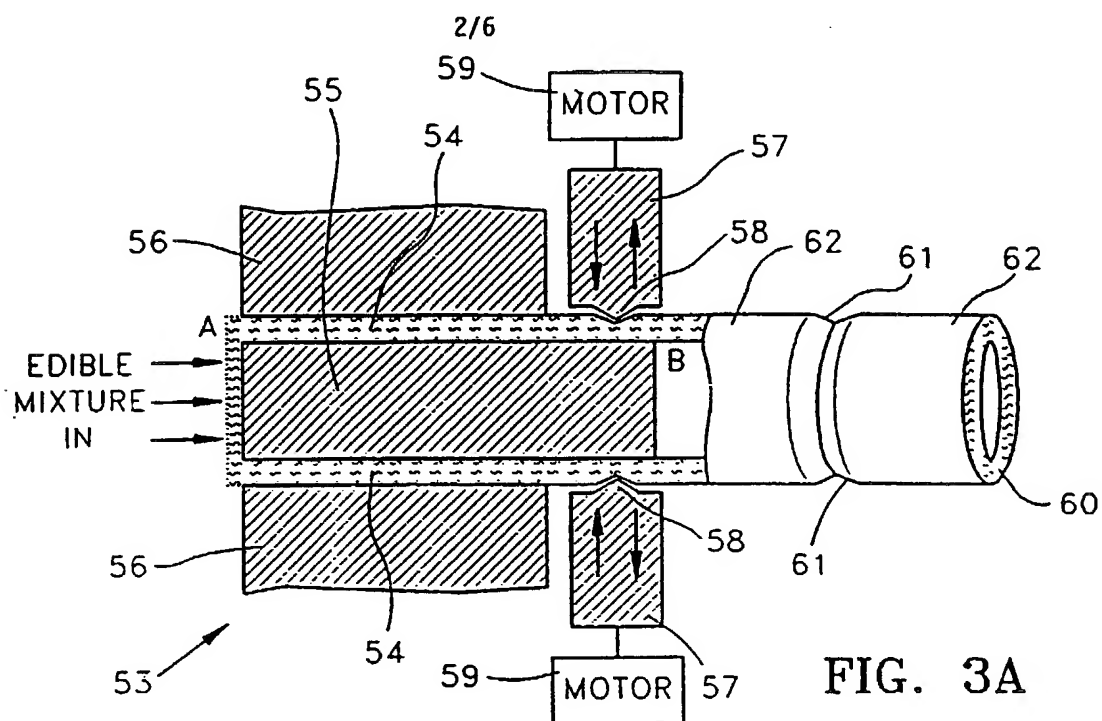
28. A method for preparing an edible stirrer according to claim 27 and comprising coating said substantially rod-like edible structure after said drying with an edible layer which is substantially resistant in a drink for an acceptable time period.

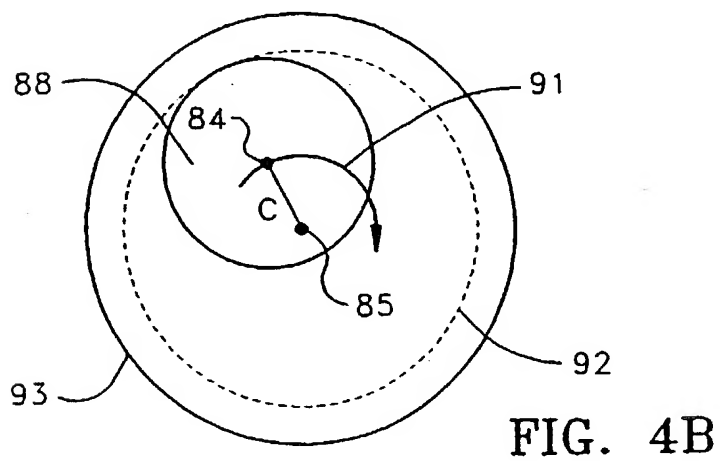
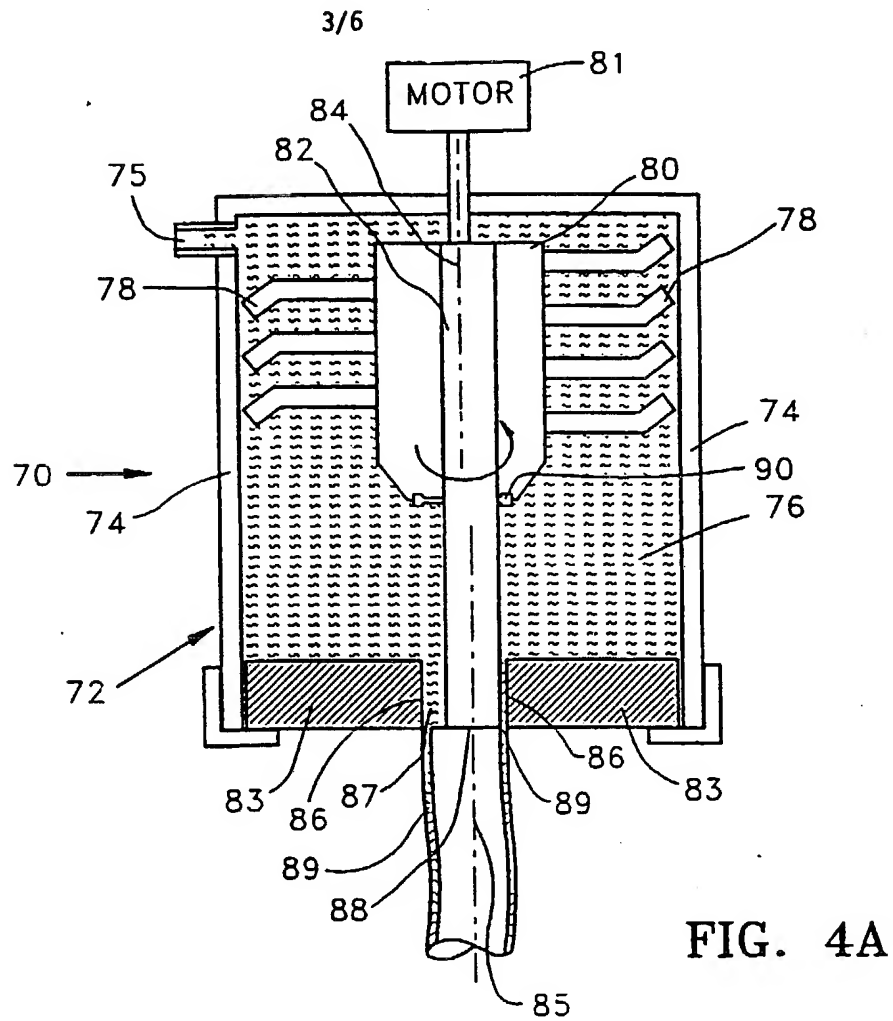
29. A method for preparing an edible stirrer according to any of the claims 24 - 28 wherein said forming comprises at least one of extruding via a shaping orifice, molding, injection molding and casting.

30. An edible chop-stick to be employed in eating food comprising at least one of a substantially rod-like and tube-shaped structure made of edible material, wherein said structure is substantially resistant in said food for an acceptable time period.

31. An edible chop-stick according to claim 30 and comprising pre-designed break points.







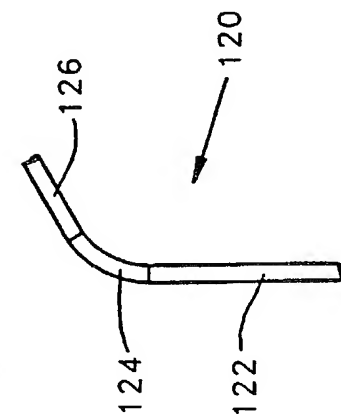


FIG. 6

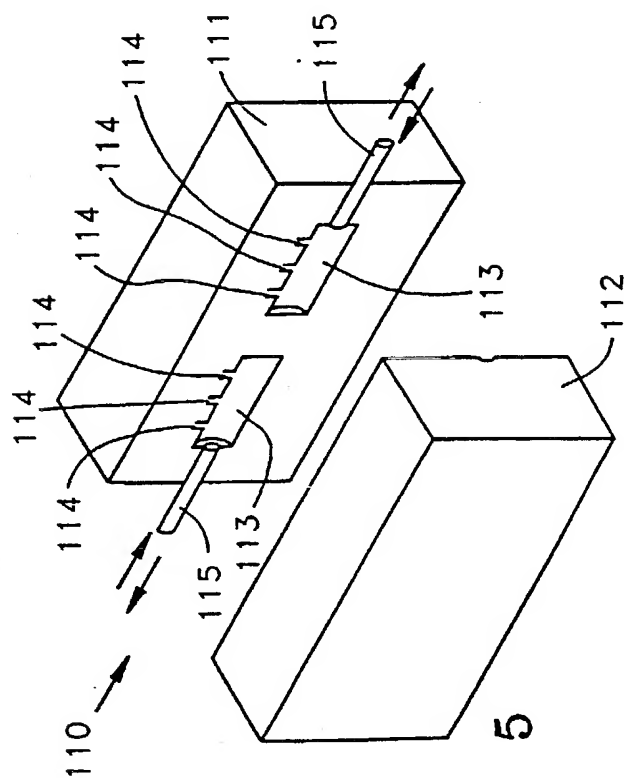


FIG. 5

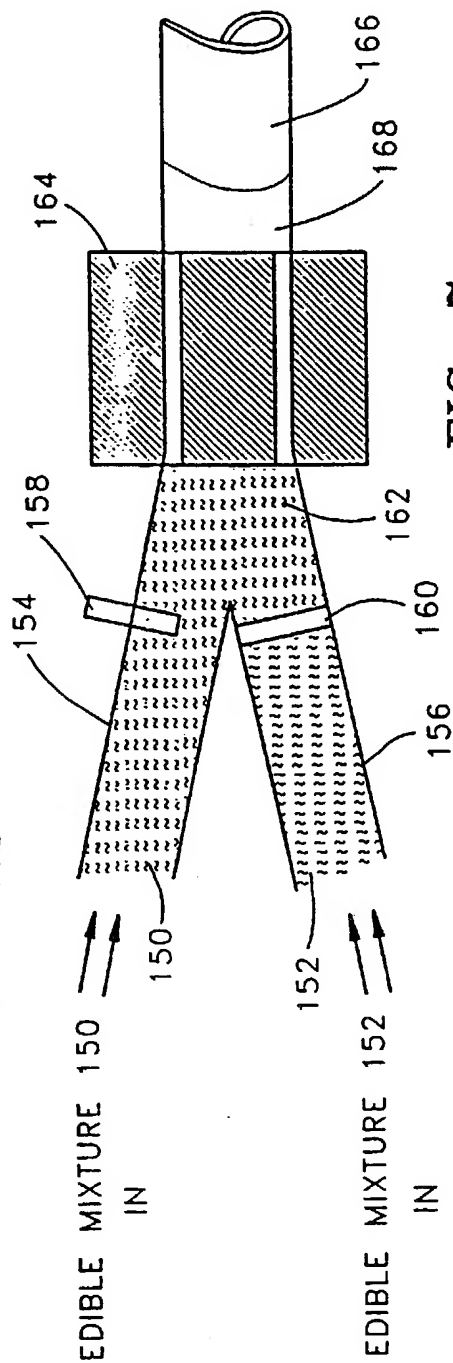


FIG. 7

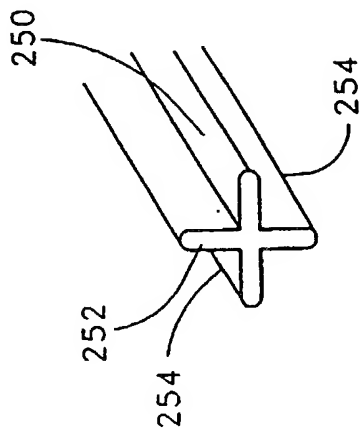


FIG. 9A

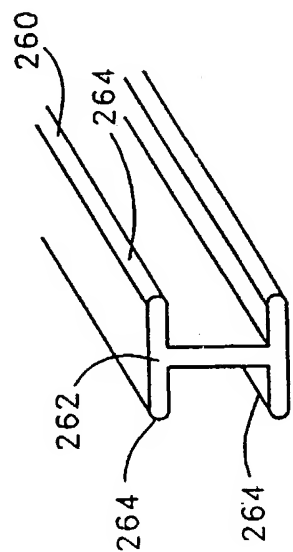


FIG. 9B

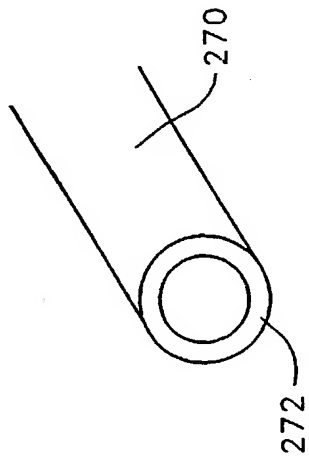


FIG. 9C

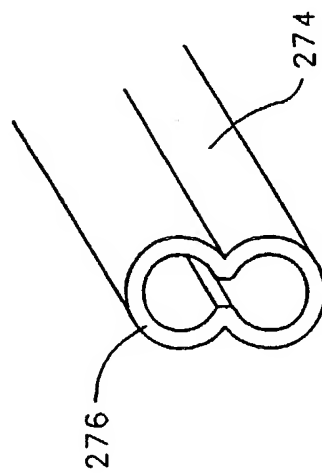


FIG. 9D

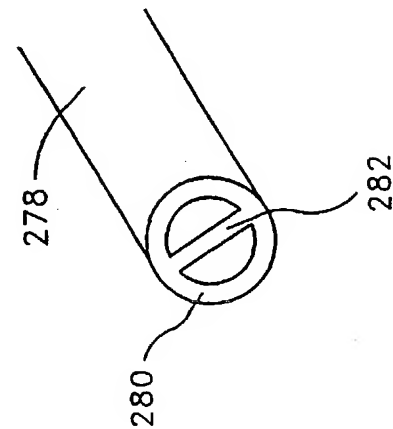


FIG. 9E

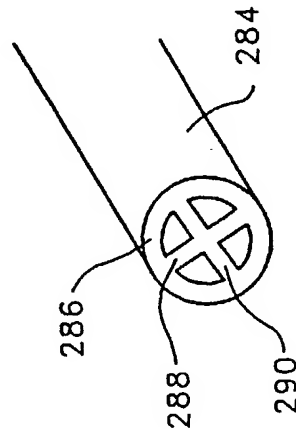


FIG. 9F

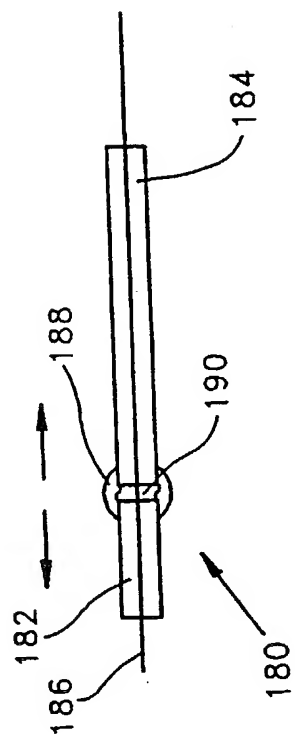


FIG. 8

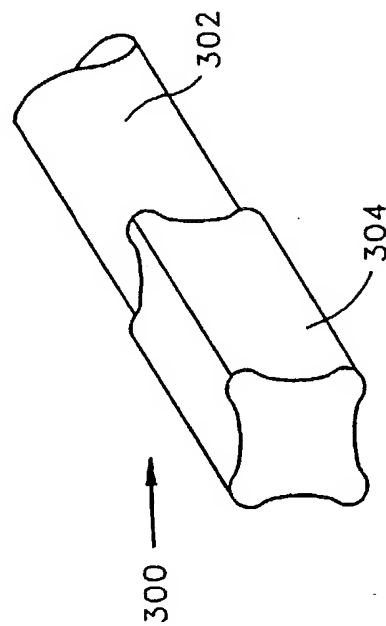


FIG. 10

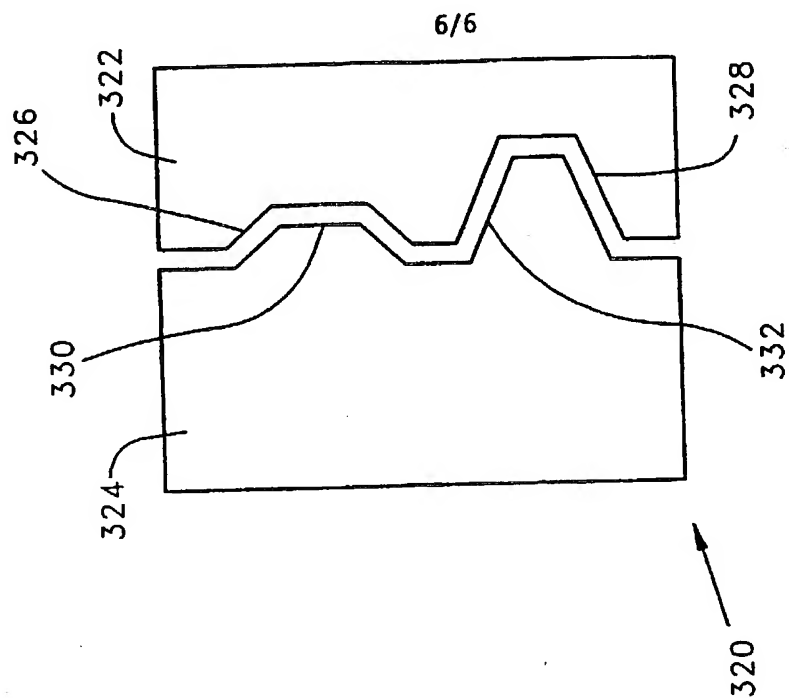


FIG. 11

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/00185

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : Please See Extra Sheet.

US CL : 426/76, 85, 94, 104, 138, 143, 391, 496, 499, 514, 516

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/76, 85, 94, 104, 138, 139, 143, 391, 496, 499, 503, 514, 516

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	GB, A, 865,615 (TURNER) 19 April 1961, see entire document.	1-3, 9, 12-15, 20 ----- 4-8, 10, 11, 16-19, 21-30
X --- Y	IT, A, 373,942 (ROSELLI) 08 August 1939, see entire document	1-3, 9, 12-15, 20 ----- 4-8, 10, 11, 16-19, 21-30
Y	DE, A, 332730 (WAGNER) 26 February 1920, see entire document.	7, 8, 16-19
A	DE, A, 1,134,607 (FISCHER) 09 August 1962.	

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

07 MAY 1996

Date of mailing of the international search report

21 MAY 1996

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

STEVEN L. WEINSTEIN

Telephone No. (703) 308-0650

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/00185

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 4,921,713 (FOWLER) 01 May 1990, see column 4, paragraph 2.	
Y	US,A, 3,824,322 (FIORELLA) 16 July 1974, see entire document.	20-31
A	US,A, 575,206 (BRITTON) 12 January 1897, see entire document.	
Y	US,A, 1,509,194 (DRESSER) 23 September 1924, see column 1, paragraph 4.	4-6, 10, 11, 21, 24-26, 31
Y	JP,A, 61-037056 (SATO) 21 January 1986, see entire document	30, 31
Y	DE,A, 3044590 (GERLACH) 03 June 1982, see entire document	30, 31
Y	US,A, 2,147,098 (HUMPHREY) 14 February 1939, see entire document	7, 8, 16-19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US96/00185

A. CLASSIFICATION OF SUBJECT MATTER: IPC (6):

A21D 8/00, 13/00; A23P 1/10